

ANALYSING STUDENTS' MOBILITY AT HIGHER EDUCATION INSTITUTIONS: CASE OF UKRAINIAN UNIVERSITY DURING THE WAR

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Abstract. Higher Education Institutions (HEIs) often overlook the importance of systematic data collection and analysis. This oversight can obscure critical trends and decision-making insights, particularly student mobility. HEIs management may not detect the outflow of students related to academic mobility and therefore will not make timely managerial decisions. This article aims to provide guidance to university management on how data collection and analysis can improve informed decision-making, focusing on student mobility, especially in times of severe disruptions, like military conflicts. To reach this goal, desk research of previous literature was conducted to identify risks and challenges related to students' mobility and the previous experience to address them. Secondary data analysis of student outflow at the Faculty of Economics of the National University "Kyiv-Mohyla Academy" (NaUKMA) from 2015–2022, alongside a student survey provided insights into the students' academic mobility process dynamics. The findings demonstrate a significant outflow of students from educational programs, highlighting the opportunities and risks associated with academic mobility. Analysis of this data reveals critical insights into student motivation, which can significantly influence their decisions and behavior. Students' mobility data analysis will instantly point out the problem to HEI management, making it possible to prevent the consequences.

Keywords: student mobility, customer analytics, outflow of students, student retention, Higher Education Institutions (HEIs).

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1. Introduction

Customer analytics initiative within higher education institutions is usually implemented and further developed by the Institutional Research Departments, Offices or other similar structures. Most of the US universities consider customer (student) analytics a well-established activity with standardised approaches across institutions. Dr James Williams states that European Higher Education Institutions (HEIs) lag far behind (Williams, 2019). As a result, data collection, processing and utilisation "lacks consistency and coordinated institutional thinking,

and leads, ultimately, to inefficiency and wasted data." The situation in Ukraine is even worse. And it brings the issue of students' analytics to the core of the Universities' future.

Students'-related institutional research covers several aspects: enrolment data and first-year students' profiles; academic results and extracurricular engagement; retention rates and graduation data. Insights universities acquire from these data provide them with an additional competitive advantage in relevantly stable market conditions. But the volatile and unfavourable environment of the Ukrainian higher education market, first disrupted by the COVID-19 pandemic and further put at risk by the full-scale Russian invasion, makes students' data analytics an essential tool for future survival. During a national crisis caused by war or natural disaster, universities face an unpredictable outflow or loss of students. And they might be unable to react quickly to the higher churn rates. But understanding the level and real reasons for these higher churn rates would help universities make evidence-based decisions and improve their market offer.

In this paper, the authors will analyse the mobility data for the National University "Kyiv-Mohyla Academy" (NaUKMA) and outline the suggested managerial actions based on the obtained results. The urgency of the research is highlighted not only by the situation in Ukraine, where the Russian Federation's full-scale invasion occurred in 2022, but also by the devastating earthquake in Turkey in February 2023. Moreover, modern historians, particularly Plokhyy (2023) and Snyder (2023), have determined that the year 2014, marked by the occupation of Crimea and Donbas, should be considered the beginning of the Russian-Ukrainian war, providing a longer context for the research. It is crucial to understand that crises can strike suddenly, making it necessary to make sustainability decisions for universities early on. Therefore, our research question focuses on identifying what data would help make HEI's managerial decisions.

The paper is structured as follows. Section 2 describes the methodology of research, while Section 3 presents the students' outflow macro trends analysis. Section 4 presents the portrait of a mobility student in Ukraine. Section 5 outlines risks and opportunities of student mobility management recommendations and discussions about student mobility. The last Section concludes the research.

2. Literature review

According to Balaz et al. (2023), the number of scientific papers with the keywords "international student migration/mobility" increased dramatically from 70 in the period 1988–2010 to 647 in the period 2011 – April 2023. However, this topic remains relevant and underdeveloped. Being a beneficial process in terms of global technological advancement and economic development, students' mobility may, at the same time, put at risk the national economies, leading to a brain drain (Kone & Özden, 2017; Robertson, 2006). Additional issues might arise as Universities lack informational systems to collect and process mobility data for informed managerial decisions. In addition to academic records, a well-thought-out database could contain a student's behavioural portrait. This would allow universities to understand the real reasons behind students' mobility decisions and the associated risks and suggest the related institutional and national policies to respond to the situation. These suggested policies and actions should balance the short-term individual safety needs and the long-term needs of society. The latter have to address the development of the economy, science, and technology and ensure the overall sustainability of the country's development and its resilience.

The COVID-19 pandemic restricted mobility, tying people to the place of their permanent residence. Students lost opportunities to travel for education, and online mobility substituted student and staff exchange programmes. On the other hand, over the past few years, many countries have witnessed armed conflicts that have relocated millions of people within the country and abroad. Though having different implications, both these forces lead to the same negative effect on the educational process – they prevent students from participating in the on-campus learning process and acquiring a guaranteed high-quality education. Due to the Russian military aggression in Ukraine, the Ministry of Education and Science of Ukraine announced a one-month vacation for all educational institutions. Many still conduct their educational process in remote or hybrid modes. But ensuring that young people have uninterrupted and secure access to higher education is crucial.

The development of Internet technologies allows universities in crisis or natural disasters to continue communication and educational processes (Ayebi-Arthur, 2017). And online education could be a best-fit short-term solution for a local natural disaster or conflict. But the COVID-19 pandemic and the implementation of online educational processes in the long term during 2020–2022 are considered by most researchers as a crisis for universities (Fernández-Batanero et al., 2022).

In addition, during a large-scale military invasion, students' security becomes a priority. Therefore, all parties consider international mobility an appropriate response to the problem. Global evacuation mobility is an opportunity for universities in the military conflict zone to provide students with security and continuity of the educational process. On the positive side, evacuation mobility programs can enhance the international reputation of universities, increase the diversity of their student body, and help to establish new partnerships and collaborations with other institutions. However, on the negative side, these programs can lead to the loss of talented students, who may not return to their home country after completing their studies abroad. This phenomenon, known as brain drain, can have long-term consequences for sending countries, especially if the students who leave are highly skilled and trained in critical fields such as Science, Technology, Engineering, and Mathematics (STEM).

Researchers and policymakers analysed the results of international mobility concerning natural disasters, catastrophes and war conflicts in Syria, the Balkans and Asian countries. But still, there is a gap in research on "forced" academic mobility (Dervin, 2011). Most researchers view student mobility as a positive factor in the internationalisation of higher education and economic growth. The fundamental book of Jared Diamond (2020) about the countries that survived the crisis shows that during periods of war and revolution, those countries that paid attention to education will be successful. This book shows the experience of Japan, Singapore and other Asian countries that have used student mobility programs to exchange ideas and implement the best practices and innovations. Viewed from a broader societal lens, international students play a pivotal role in enhancing their chosen educational destinations' academic and communal environments. Their presence not only elevates the standards of educational institutions but also enriches the learning experience for domestic students and is driven by the diverse perspectives and cultural richness they introduce to higher education settings (Statistics Canada, 2016).

Policymakers investigated the factors and drivers of students' mobility and the problems students faced to stimulate the process. Research (Didisse et al., 2019) on student mobility from poorer countries to more prosperous countries indicate that access to higher education in the home country, recognition of the merit of home universities, and non-material factors of the country's attractiveness are significant factors. The European Erasmus mobility program

has played a substantial role in increasing student mobility and migration, as demonstrated by the authors of the research. It also found that young people with friendship ties in another country or who have had previous student mobility experiences are more likely to leave their home country.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) research (Bhandari et al., 2018) also shows that the USA, Great Britain, and Germany are the most popular for student mobility. Among the factors that drive student mobility is the possibility of professional migration, otherwise the opportunity to stay in the host country. It is also noted that improving economic ties between countries, for example, the countries of Africa – China, lead to increased student mobility flows. The globalisation of the workforce and careers incentives students to pursue all or part of their higher education abroad to gain the global competencies that employers seek. Unfortunately, this study does not cover emergency and evacuation mobility aspects. However, we will assume that the possibility of skilled migration for students on mobility in a more prosperous country will be of greater importance.

The No Lost Generation (NLG) initiative was launched to support youth affected by the conflict in Syria and Iraq. For 6 years of military conflict, access to higher education among young people (18–25 years old) in Syria has decreased to 5% (by 15 percentage points). Asian countries (Iraq, Jordan, Lebanon and Turkey) have developed a mechanism to increase the access of young Syrians to higher education. Still studies on the effectiveness of such policies are currently not available (UNESCO, 2017). The research on the experience of Syrian universities in the war zone found that Syrian university students face five main problems when trying to find new academic houses in the region or abroad: (1) lack documentation or credentials indicating courses taken and grades earned; (2) lack access to information about the scholarship or other programs that could assist in finding, applying, and matriculating to a new university; (3) difficulties with the language; (4) discrimination in the host country (especially severe in Lebanon and parts of Turkey, as well as parts of Europe), which may make these universities less welcoming to Syrian students; (5) significant financial expenses (Institute of International Education, 2016). The research (Cambridge Education, 2017) on the activity of HEI during the war in Syria in 2016 describes the provision of access to higher education for Syrian refugee students.

Another research (Li & Lowe, 2016) also views student mobility as a war for talent. The authors of this research concluded that universities are being incorporated into a competitive “war for talent” in which national economic success is heavily dependent on recruiting the most talented and highly skilled students. The goal is to attract these students from across the globe and retain them as high-skill workers in the host country. While researchers have looked at how international students decide to study outside their home country, research is limited regarding their experiences after completing their studies. One area lacking information is international students’ intent to stay in their host country versus return to their home country for work (Gesing, 2017). However, this approach risks compromising the academic research and scholarship integrity and value. Researchers must resist being fully recruited into this global talent war to maintain the autonomy and value of their professional and disciplinary calling.

It is also worth noting that the security factor can only be a catalyst for the student’s mobility decision, not its primary reason. As a result, a sincere desire to help in the short term, wider opportunities for mobility and better conditions from the host countries will only increase the brain drain.

The investigation of “Student mobility in the Western Balkan countries” is a compelling subject of study. Despite being conducted in 2016, more than fifteen years after the conclusion of the Balkan wars, it remains relevant in the present time. The authors explore the motives of students who participate in student mobility programs from four Balkan countries: Albania, Serbia, Bosnia and Herzegovina, and Montenegro. The study reveals that the primary motivational factor for student mobility is further career development, as noted by more than 80% of students from countries such as Bosnia and Herzegovina and Montenegro. However, students from Albania highlighted that an essential motivational factor for them is specialisation in their field of study.

The study’s conclusions and results are noteworthy, as they indicate a significant number of students who do not plan to return to their home countries and intend to seek employment abroad. The percentage of students seeking work outside their country ranges from 19% in Albania to 26% in Bosnia and Herzegovina. These findings are a cause for concern, and they signal the need for further work with students participating in mobility programs. Although most students plan to return to their home countries and look for employment there, the percentage of those who plan to seek employment elsewhere raises alarm bells. Therefore, it is essential to address this issue and develop strategies to support the professional growth of these students in their home countries. This topic about the job policy of young people’s adaptation will be extremely important for Ukraine after the war conflict is over (Besic, 2009). As we can see, the research on universities in the conflict zone is often limited to studying barriers to student mobility. However, according to the authors, such an approach can lead to brainwashing and the disappearance of universities in the country. Therefore, we consider student mobility through a different lens.

3. Methodology

The research methodology is three-fold: desk research, data collection and analysis of the student flow for 2015–2022, and the student survey at the Faculty of Economics of the National University “Kyiv-Mohyla Academy”. Ukrainian and European universities (with which the authors communicated during the research) do not systematically collect analytics, although there is data with information about students (e.g., number of students, selected courses, host universities etc.). Data analysis in universities is undeveloped. The authors had to collect information and data from several sources and paper documentation from all the indicated years. Corresponding documents are not transferred in digital format. As a result, the data are not structured and accumulated to be convenient to analyse.

The desk research aimed to analyse literature, university documents and Internet resources on the outflow of students during the crisis. The availability of data from 2015 made it possible to analyse the situation before the COVID-19 pandemic (2015–2020), during the COVID-19 pandemic (2020–2021) and the Russian war (2014–2022) and cover all NaUKMA students across NaUKMA (up to 4891 students). The authors also used the results of a March 2022 survey (number of respondents – 61 out of 309) conducted by the Dean’s Office of the Faculty of Economic Sciences of the NaUKMA (it was a month after the full-scale Russian invasion). Thus, this is a unique study covering the period of influence of two crises on the educational process. The referred data made it possible to determine the dynamics of the students’ mobility.

On the next stage, the online student survey clarified the desk research results to obtain information about students’ motivations and outflow risks. The authors surveyed students who were on mobility programs abroad in January 2023.

The online questionnaire was developed.

The following three main conditions were decisive in selecting the online questionnaire format:

1. The need for a remote survey of many students who are in different countries.
2. The need for students to choose a convenient time and date during the survey period to complete the questionnaire (approximate 30-minute duration).
3. Unpredictable outages of electricity, mobile communications, and the Internet due to Russian attacks on Ukraine's infrastructure required asynchronous interaction between research participants and authors.

The survey contained structured and closed-ended questions in the form of a questionnaire to be filled out online. During the survey, the data was collected and stored in Google Forms and then analysed.

4. Students' outflow macro trends analysis

Student attrition is always present. NaUKMA, an educational institution attracting the most intelligent and motivated students, had a relatively low attrition rate. Figure 1 demonstrates the overall student attrition rate at the National University "Kyiv-Mohyla Academy".

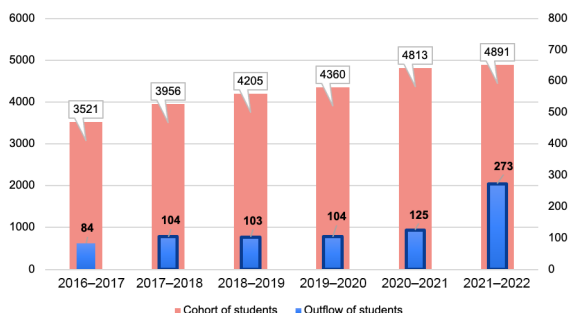


Figure 1. General outflow of students at NaUKMA in 2016–2022 (source: own calculations based on university internal data)

The first sharp increase in the 2016–2017 academic year is associated with a change in the evaluation system of the results of the External Independent Testing. After this, we observe almost no fluctuations until the 2020–2021 academic year. This is the university's first year of fully online learning due to the COVID-19 pandemic. Since the beginning of the pandemic and the transition to remote education started in the spring semester of the 2019–2020 academic year, students have already been studying remotely for 1.5 years.

As we can see, the 2021–2022 academic year was “shocking” for educational institutions due to the onset of a full-scale invasion. The graph shows that the student attrition rate increased by more than twice. If the attrition rate before was 2–2.5%, it reached 6% in the 2022–2023 academic year. However, the most crucial point to note is that the structure of attrition has changed over the last year (see Figure 2).

Figure 2 shows the structure of student attrition for a more detailed analysis. We can see almost stable indicators of student expulsion due to academic debt until the 2020–2021 academic year. This was the first year of fully online learning, impacting the quality of education.

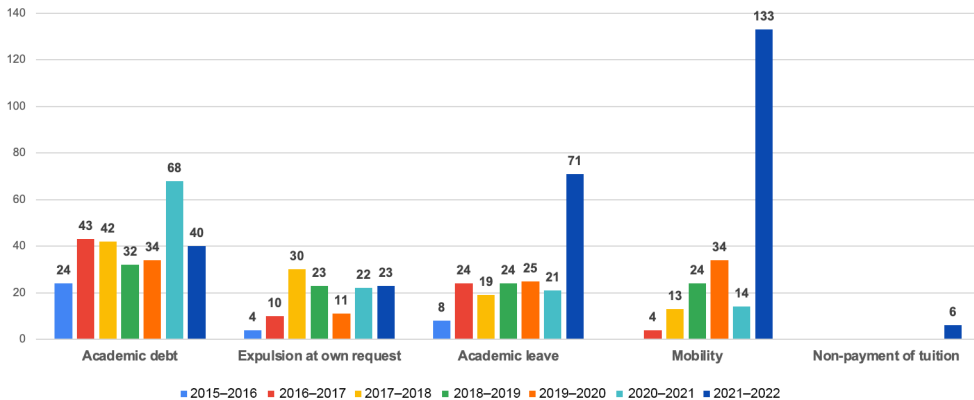


Figure 2. Structure outflow of students from the Faculty of Economics at NaUKMA in 2015–2022 (source: own calculations based on university internal data)

However, as the graph shows, despite the military invasion, the number of expulsions in the 2021–2022 academic year has again stabilized, indicating the possibility for students to focus on their studies even in a crisis. The attrition rate for the “voluntary withdrawal” category has remained almost unchanged throughout the entire study period. In most cases, these are students whose expectations were not met.

Applications for academic leave also remained stable until the beginning of the full-scale invasion. However, by 2022, almost 90% of applications were related to students’ inability to continue their studies due to a tough psychological state, health problems, or financial difficulties in their families. (These are confirmed by the student survey presented in Table 1, conducted at the end of March, on the possibility of continuing their studies online.) In private, these students expressed a desire to return to their studies after the situation stabilizes. The rates of international academic mobility of students demonstrate the most dynamic indicators.

According to other statistics from UNESCO (2020), Ukraine already had many students studying abroad before the country experienced a full-scale invasion. The top five countries in 2020 were Poland, Germany, Slovakia, Czech and the USA (Table 1). Regrettably, Russia was second place in 2019, a country-aggressor, which suggests a well-planned propaganda-driven agenda.

Table 1. Ukrainian Students’ mobility, 2020 (source: UNESCO, 2020)

	Country of destination	Number of students
1	Poland	27 068
2	Russian Federation	21 609
3	Germany	6759
4	Slovakia	3949
5	Czechia	3811
6	United States	1818
7	Austria	1455
8	Canada	1344
9	Hungary	1207

Interestingly, an apparent imbalance existed between Ukrainian students studying abroad (approx. 80,000) and international students studying in Ukraine (approx. 70,000) in 2020 (UNESCO, 2020). This suggests that there was already a disparity, with 10,000 more Ukrainian students pursuing education overseas. It is conceivable that very few international students remain in Ukraine today, and considerable effort will be necessary to attract them back following the war. The 2020–2021 academic year coincided with quarantine restrictions associated with the COVID-19 pandemic, which decreased the number of universities willing to accept students for mobility programs. The surge in 2022 is related to “evacuation mobility”.

According to the Ministry of Education and Science of Ukraine, as of February 2023, approximately 4.2 million students are enrolled in Ukrainian higher education institutions, of which about 641,000 (~15%) are currently studying abroad (Ministry of Education and Science of Ukraine, 2023). However, this figure requires clarification and verification. EU countries are trying to clarify the number of displaced persons. There are no precise statistics on the number of school graduates enrolled in foreign universities (direct outflow/losses, not through mobility programs). There is no open data on academic mobility in other higher education institutions. Still, according to the Erasmus+ report “Ukrainian students abroad” (Fedorchuk et al., 2022), 38% of Ukrainian higher education institutions are more supportive of mobility (see Figure 3).

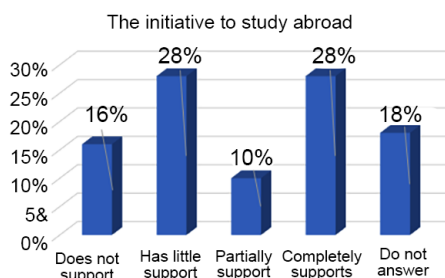
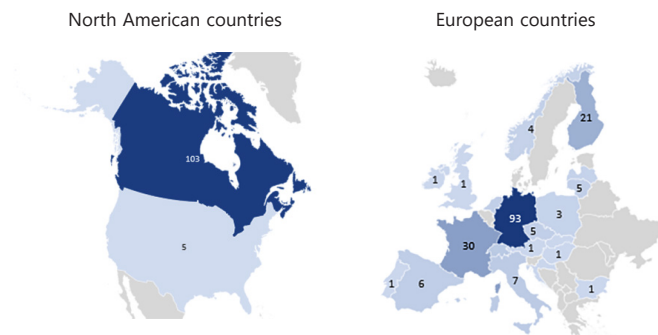


Figure 3. Ukrainian HEIs support the initiative to study abroad in 2022 (Representative sample 464 students) (source: own calculations based on university internal data)

The NaUKMA international department negotiated the possibility of emergency placement of students in educational institutions in the countries/cities where they travelled. Most students received offers from universities to extend their mobility programs, so the number of students currently on mobility in the 2022–2023 academic year remains high. It is also worth noting that the NAUKMA administration is actively promoting the international integration of students. A series of negotiations and agreements have been made, including with the University of Toronto, Canada, which, thanks to funding from the Temerty Foundation, accepted 95 students in the fall semester of the 2022–2023 academic year.

In terms of the geographical distribution of mobility, it is noteworthy that a total of 26 countries have hosted NaUKMA students. A comprehensive list of the countries and the number of students enrolled from both the university and the Faculty of Economics, who are currently studying at universities located in these countries, is provided in Figures 4–5.

This information highlights the extensive scope of international mobility and the global reach of NaUKMA's academic programs. Canada, Germany and France are Top-3 countries



Note: If there are only 1–2 students, this is considered a self-initiated mobility, meaning that the student themselves found the program and initiated the mobility.

Figure 4. Number of mobility students from the Faculty of Economics at NaUKMA by countries. Completely coincides with the general distribution by NaUKMA (source: own calculations based on university internal data)

to host Faculty students. Germany and France were the European countries where mobility programs were also most frequently conducted prior to the full-scale invasion. Canada is the second most popular country thanks to the special agreement with the University of Toronto.

The data also underscores the university's commitment to allowing its students to gain international experience, exchange knowledge, and expand their perspectives beyond national boundaries. The diversity of countries hosting NaUKMA students attests to the value and recognition of the university's academic excellence. It enhances its reputation as a leading institution of higher education in Ukraine and beyond.

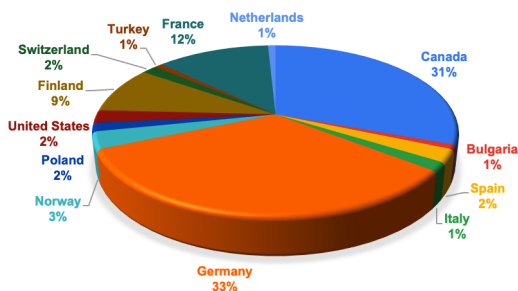
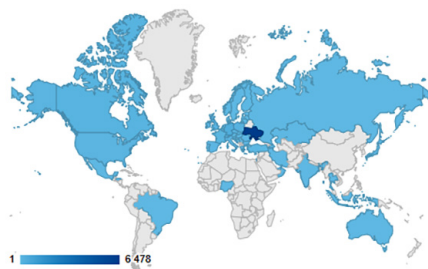


Figure 5. Distribution of mobility students from the Faculty of Economics at NaUKMA by countries in 2022–2023, % (source: own calculations based on university internal data)

However, when considering the overall migration of students, the scale is significantly larger than that of mobility programs. Utilizing regional analysis of users of the Moodle platform, we can observe users from over 58 countries from 23.01.23 to 20.02.23. Additionally, the total number of students and educators outside Ukraine currently exceeds 1,800 individuals (see Figures 6–7).



Note: * Several (7) users from the Russian Federation are most likely located in the occupied territories.

Figure 6. Moodle users' distribution from NaUKMA, extracted from Moodle from 23.01.23 to 20.02.23 (source: own calculations based on university internal data)

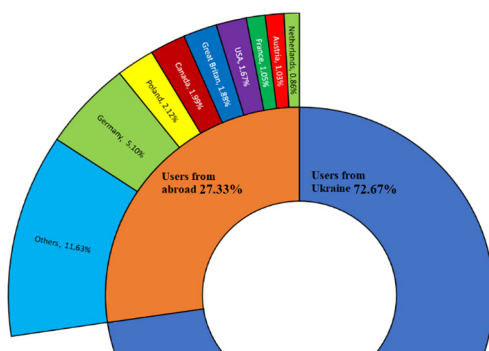


Figure 7. Users' distribution from Moodle platform from NaUKMA (March 2023) (source: own calculations based on university internal data)

The regional distribution of Moodle system users is confirmed by data obtained from Google Analytics. We do not observe any return of students. The number of users abroad remains constant. We understand that there is a gap between the overall university mobility data and the number of users from abroad on the Moodle platform. But to finally calculate this gap, additional analytics are needed. This means that some students are not participating in mobility programs but are studying from abroad. This percentage is insignificant, but we have no analytics for these students and do not control their intentions and returns.

5. Portrait of a mobility student

We surveyed NaUKMA students enrolled in international academic mobility programs in the fall semester of the 2022–2023 academic year. The total number of students was 309, and we obtained responses from 61 respondents, representing 20% of the total population.

In the 2022–2023 academic year mobility programs, 86.9% of participants were female, which can be explained by the enactment of martial law in Ukraine and restrictions on travel for males. 32.8% of the survey participants were third-year bachelor's degree students, while 24.6% were second-year bachelor's degree students. All participants indicated proficiency in English, with 37.7% also indicating proficiency in German.

Furthermore, 47.5% of respondents indicated that this was their second mobility experience. The data shows that 100% of the students who went on evacuation mobility in the spring of the 2021–2022 academic year continued their participation in mobility programs for the fall semester of the 2022–2023 academic year, and new students also joined the programs. Therefore, we can conclude that the outflow of students has further increased. Of the survey participants, 55.7% expressed a desire to continue their education at the next educational level abroad, which confirms the theory of student mobility as a means of skilled labour migration. Most survey participants indicated Germany and Canada as their countries of mobility. The analysis of the motivational factors of Ukrainian students and their behaviour during mobility showed that if the first mobility of a student was to a not well-known university, they try to get to a university with a higher ranking in Germany or France for the second mobility. This puts the Ukrainian labour market at risk of losing this qualified young population. Our research has shown that mobility programs lasting over a year lead to young people staying in more economically developed countries with more attractive job market conditions.

The survey identified three groups of motivational factors determining students' willingness to participate in mobility programs:

1. The desire for new knowledge and experience.
2. Career advancement.
3. Safety and security issues.

Almost all participating students, regardless of the destination country's economic development or prevailing circumstances, expressed the desire to share experiences and learn new things as a motivation for mobility. Mobility programs are fundamentally grounded in this desire; survey data supports this priority. The top indicator for students was the "desire to gain interesting experience", selected by 93.4% of respondents. While students did not specify the type of experience they sought, we can interpret this indicator as readiness for change and openness to new knowledge and experience. Additionally, a relatively high percentage of students (68.9%) selected the opportunity to learn various methods and practices or explore disciplines not offered by NaUKMA (57.4%) as a motivational factor.

The second motivational category emerges when the host country boasts a more developed economy or attractive labour market. In this case, choose the "expansion of career opportunities" (80.3%) and "networking" (49.2%) motives. The numbers demonstrate a high risk for the Ukrainian economy, as career opportunities in any host country are considerably higher than those in Ukraine. Respondents (67.2%) noted that it is important for them to have a more competitive position on the labour market in Ukraine. 59% indicated they consider the competitive advantages in the labour market abroad. There is a high probability that this group of students will not return to the country.

Motivational factors arising from military operations or natural disasters represent a separate category. It is essential to analyse both numbers and the content of the situation in these cases. While NaUKMA is not within the immediate military conflict zone, Kyiv is subject to constant air raids and shelling. In addition, energy supply problems severely hamper educational processes. Therefore, it is essential to strategically analyse motivational indicators and their dynamics concerning military actions in Ukraine. These factors are not ranked first but are highly prioritised depending on the student and higher education institution's location. The "desire to be safe" (65.6%) is a key indicator, and half of the respondents (52.5%) noted the "difficult conditions for quality education in Ukraine (lack of light, vocational training)" as a significant factor. It is worth noting that the survey was conducted in the winter of 2023 when the situation in all regions was critically challenging.

Separately, we would like to draw attention to the high value of the language indicator (73.8%), namely "the opportunity to learn a foreign language". Though all students declare good command of English, they are still willing to improve their foreign language skills. This is a predictive signal for developing joint English-language programs at NaUKMA.

One of the survey's objectives was to identify the level of "brain drain" risk related to students' mobility. When directly asked whether students intend to return to Ukraine (see Figure 8), a large share (43%) indicated that they do not plan to do so at the moment, and 22% hesitate. But the non-return rate is down to 34.6% when certain conditions are met.

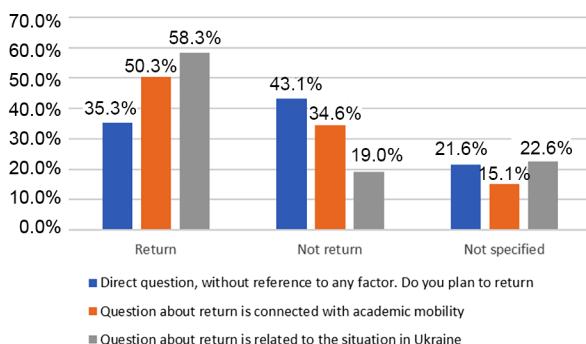


Figure 8. The dependence of students' return to Ukraine on various factors (sources: own calculation based on survey results)

Factors related to academic mobility, such as the end of mobility, acquiring new knowledge and skills, and expanding connections abroad, appear important. Half the students, 50.3%, intend to return to Ukraine after the above-mentioned conditions are met, and 15% are not sure yet. 34% of the students are unwilling to return after the mobility program or would like to prolong it.

Even more, students will return to the country when the situation in Ukraine changes for the better. If the situation becomes more secure, the infrastructure is restored, there are prerequisites for creating startups, and the war ends, the return percentage of students will increase to 58%. 23% are still unsure, and only 22% do not intend to return in any case. This last number is 21 p.p. less than the corresponding number of the unconditional return.

Our numbers are consistent with the data from another survey conducted by the NaUKMA School of Political Analysis (SPA) (Osypchuk et al., 2022).

Students who studied or continued their studies in Ukrainian higher education institutions as of June–July 2022 are optimistic about the "brain drain" problem. The survey provides insights from students in Ukraine, with 16.52% of respondents located outside the country and 2.61% participating in international mobility programs. According to the survey responses, most respondents believe that their friends who are currently abroad are planning to return to Ukraine, with 51.3% of respondents mostly or entirely agreeing with this statement.

The survey results indicate that many different, sometimes unrelated factors influence students' decision to return to Ukraine. The level of uncertainty is relatively high and varies from 15% to 23%, which indicates that the decision-making process is complex in the current situation. In addition, the non-return rate is high and may increase depending on the further development of the situation in Ukraine.

6. Student mobility: management recommendations and discussions

The mobility of Ukrainian students has shown unprecedented growth after the start of the full-scale military invasion. On the one hand, it is related to the solidarity and support of the academic community of Ukrainian universities, which found themselves in the terrible situation of military operations. On the other hand, Ukrainian students are highly qualified to study at foreign universities.

Mobility initiatives are an additional competitive advantage for universities within the educational program marketplace. Institutions that provide compelling mobility opportunities hold the potential to entice superior prospective students and scholars. Consequently, the university harbours a favourable perspective toward student mobility, actively fostering its advancement. The amassed analytical data, acquired from an array of paper-based sources, is one of the instruments enabling the identification of challenges and risks faced by universities, in addition to prospective avenues for growth. Thus, this analytical data empowers the formulation of informed management decisions and cultivates institutional resilience in the face of crises, including war, pandemics, and natural disasters.

Therefore, we suggest treating students' mobility issues within universities in two dimensions: creating a mobility analytical system as a part of HEI business intelligence and using analytics results to identify risks and opportunities for HEI development.

6.1. Students' mobility risks and opportunities

Does student mobility directly threaten the universities themselves and the community? Will student mobility be the cause of "brain drain" from the country, and how to turn this "brain drain" into "brain circulation"?

In the short term, a significant reduction of students directly affects teachers' workload. Consequently, the loss of students leads to the need for university administrations to make difficult decisions regarding cancelling academic disciplines and educational programs, laying off academic and non-academic staff, and diversifying funding. One way to close the gap caused by the outflow of students in the short term is to put more effort into recruitment campaigns to enrol more first-year students. And universities may use mobility benefits as one of the elements of their value proposition for the newly enrolled: the affiliation with Ukrainian universities gives students broader academic mobility opportunities.

But to benefit from academic mobility and turn it into a competitive advantage in the long term, the process must be accompanied by controlled and planned quality analytics.

It is essential to prevent "brain drain" through the development of the student's mobility policies and turn "brain drain" into "brain circulation". Cooperation initiatives should generally avoid brain drain for Ukraine and address more sustainable solutions that would allow Ukrainian universities to keep their academic and non-academic staff as well as their students; all of them are crucial to enable the continuous operation and existence of the Ukrainian educational system. Ideally, partnerships created now will build a foundation for deeper integration of the Ukrainian educational and research system into the European and Global educational ecosystem. Now, we are observing the emergence of a "global chain of specialist training" when bachelor's training can take place in several countries over four years. And although, for Ukrainian universities, this situation was provoked by a full-scale invasion and the conduct of military operations on its territory, world universities should pay attention to this trend, as it is a manifestation of globalisation in a conservative academic community. And

all parties can benefit from the process if knowledge exchange is ensured between developed and emerging countries and a brain circulation network is created.

Some of the suggested actions for Ukrainian universities within this process may cover the following aspects:

1. Empowering Ukrainian universities for international cooperation:

- Forming Ukrainian academic and scientific diaspora and ambassadors of Ukrainian HEIs abroad.
- Creating alliances/consortia for project work.
- Developing double degree programs.
- Tandem teaching (when the teaching of the discipline is distributed between several teachers from different countries).
- Synchronising of educational programs (at the same time, it is also important to preserve their individuality).
- Creating efficient institutional procedures and support for student mobility.

2. Creating an environment for returning the students to their home universities to study or implementing their projects:

- Developing innovative programs and courses to attract and retain students;
- Building strong partnerships with other universities and industries to provide better opportunities for students;
- Creating a friendly environment where students can have social or emotional bonds with their home academic community while studying at the host university;
- Offering financial assistance to students who face financial difficulties due to the crisis upon returning;
- Providing psychological and emotional support to students who may be struggling due to the crisis;
- Involving students in student self-government to foster a conscious social position and a desire to return to their home university;
- Collaborating with the government to create policies that promote the retention of students in the country.

Additionally, each higher educational institution should also aim to attract international students after the end of the war.

By taking these steps, universities can ensure that they remain competitive, even in the face of challenges posed by student mobility.

6.2. Students' mobility analytics and discussions

The war contributed to the escalation of Ukrainian student mobility. However, the gradual growth and trend of student relocation to EU countries for education preexisted this event. Hence, Ukrainian universities ought to have commenced preparations for a substantial student outflow to pursue education abroad earlier; regrettably, they failed to prepare analytically and managerially.

The research findings indicate the significance of quantitative and qualitative mobility analytics in times of war and crisis to identify risk factors and enhance the resilience of higher education institutions.

Our study largely corroborates the findings of previous research conducted by the School of Political Analytics NaUKMA and the Ministry of Education (MoE). In terms of students' intentions to return to Ukraine, the SPA study reports a rate of 46% (Osypchuk et al., 2022),

whereas NaUKMA indicates a lower percentage of 30%. Conversely, regarding students who do not plan to return, the SPA study reveals a rate of 20% for SPA (Osypchuk et al., 2022) and 34% for NaUKMA. A considerable proportion of participants remain undecided about their future plans. But even the lowest figure is a big risk of brain drain.

In relation to the prevalence of students relocated abroad, varying figures are reported. The Ministry of Education of Ukraine estimates a percentage of 15% (Nikolaiev et al., 2023), while SPA reports 16.52% (Osypchuk et al., 2022), and NaUKMA records the highest rate of 27.33%. The elevated proportion at NaUKMA can be attributed to two significant factors. Firstly, the institution's management actively promotes and supports academic mobility among its student body. Secondly, our study incorporates data from an online educational platform that captures mobile students and those who independently left the country (entrance from an IP address). However, it is essential to conduct further investigation to refine and clarify the final figures, as the discrepancies in reported rates persist.

Additionally, it is worth noting that the studies' timing varied, occurring during different periods of military escalation spanning from June 2022 to March 2023. This temporal variation could substantially influence respondents' answers, thereby contributing to the observed discrepancies.

In this regard, we recommend that universities gather the following data related to students' mobility:

- Percentage of returning students from academic mobility programs.
- Percentage of students who extended their mobility programs.
- Percentage of students who take an educational leave.
- Percentage of students who withdraw from the institution.
- Socio-demographic portrait of the mobility participants (age, family status, income level, gender, previous education etc.).
- Mobility motivation factors.
- Data on hosting institutions and chosen curricula.

These measures will enable universities to monitor the current situation and adjust their policies and actions, accordingly, thus ensuring high student satisfaction and improving university action plans for students' retention and brain circulation.

Knowing individual character traits may help identify potential academic mobility participants as well as the risks of their further migration as those are already investigated by the researchers. Studies show that openness (Jokela, 2009), together with low non-agreeableness, conscientiousness and neuroticism (Fouarge et al., 2019) are associated with higher probabilities of international migration. According to Sadeghi et al. (2023) mobility students possess these same factors – extraversion and openness. Mobility experience as a sign of direct experience of migration has a positive and statistically significant effect on migration propensity (Addeo et al., 2023). A study by Weber and Saarela (2023) also proves that student migrants were the most likely to immigrate for a second time. However, according to Luque-Martínez et al. (2023) participants of the exchange programs demonstrated higher willingness to repeat their university studies. Previous research on the reasoning for students returning to their homes after studying at the university, conducted, e.g., for Portugal (Simões et al., 2021), Switzerland (Oggenfuss & Wolter, 2019), Italy, and Spain (Addeo et al., 2023) on the country's internal and international mobility, can be considered for designing a mobility data-management system to track behavioural factors. An ongoing war in Ukraine showed to be also influencing students' return/non-return decisions. Lee and Sehoole (2020) provide further confirmation that stability and security at home is one of the crucial arguments for

student mobility to South Africa (both for political stability and security, or students seeking security). Though signaling increased brain-drain risks, the negative influence of these factors might be minimized through appropriate communication, as previous research in Israel demonstrates that high ideological and religious connections with the country may even motivate international student mobility towards conflict zones (Ben-Tsur, 2009). Data-based approach to addressing mobility students within university activities could allow for appropriate adjustments to increase students' loyalty and connections with the home university to create the basement for future cooperation and brain circulation even in the case of drop-out and migration.

In addition to micro-level factors, data on receiving countries and universities should be also collected and used to develop university internalization policies. Our analysis showed vivid preferences of students towards certain countries and universities with Germany and Canada being the most attended countries. Yet it contradicts with Weber and Van Mol's (2023) conclusions, that students from medium developed countries tend to migrate to lower-ranking destination countries. This might be due to the fact of specially tailored programs or a local national diaspora in the receiving countries. These differences in data demonstrate that mobility is a complex issue and further research is needed.

The European Education and Culture Executive Agency is collecting and analysing student mobility data on EU level. Ukraine as an associated member is not included in their report (European Education and Culture Executive Agency, 2023). Therefore, it would be reasonable to use the Eurydice methodology to monitor the situation in Ukraine by local authorities or organisations or advocate the inclusion of Ukrainian mobility processes into the EU monitoring. Simultaneously, Ukrainian universities might use the EU strategic approach to build their students' mobility analytics.

Establishing data collection systems in universities with no analytics gathering can be challenging in terms of data science expertise (Daniel, 2019) and time-consuming and may not yield immediate financial results. The investigated NaUKMA case demonstrates that data mining and analytics on students' mobility is not a management priority. Moreover, literature search returns only scarce publications on using education data mining to analyse students' academic mobility (e.g., Damar, 2022), mostly concentrating on students' educational performance for the drop-out prediction or internal specialty mobility. However, the absence of such work threatens the university's existence. Without analytical data, top university management may not notice the increasing student attrition due to decreasing solvency or other reasons, as demonstrated in the analytical section of this article.

Analysing existing automated solutions for data collection is recommended to initiate such work. Implementing such solutions will significantly facilitate data collection and processing, enabling university management to make informed decisions promptly and ultimately contributing to the institution's success and sustainability. Examples of such systems include Mobility Management Systems, Student Management Systems, Student Connectivity Module (Materka et al., 2012) and Erasmus's integrated system for all participating universities – Erasmus+ Without Paper (Fedorchuk et al., 2022). In addition, some education data mining tools that proved to be valuable for other management issues, can also be appropriate to identify patterns and predict students' mobility (e.g., Sankey Diagram (Oran et al., 2019), logistic model and network approach (Columbu et al., 2021)).

7. Conclusions

In the current research, the authors outlined the structure of student outflow from educational programs and focused solely on examining the flow associated with mobility programs. The authors demonstrated which data would aid in comprehending students' motivations and, consequently, influence their behaviour. First, it was confirmed that the home country crisis increases students' mobility, posing risks on universities and brain drain. Second, the research suggested a Ukrainian mobility student portrait, where desire for new knowledge and experience, career advancement together with safety and security issues are the main motivators to study abroad. Third, it was identified that negative outcomes of students' mobility can be de-risked providing that universities use data-mining and data analytics.

To prevent losing student cohorts, it is recommended that universities implement joint programs and tandem teaching (co-teaching of disciplines) to overcome these risks. Particular attention should be devoted to fostering robust connections between students, academic staff and the university community. Regrettably, distance learning does not facilitate this process.

Solutions should be thought of from a long-term perspective. Cooperation initiatives should generally avoid Brain Drain for Ukraine and search more for sustainable solutions that would allow Ukrainian universities to keep their academic and non-academic staff as well as their students; all of them are crucial to enable the continuous operation and the existence of the Ukrainian educational system. Ideally, partnerships created now will build a foundation for deeper integration of the Ukrainian educational and research system into European space.

This paper has several research limitations. First, this current study mostly utilises the Economic faculty and NaUKMA data on students' mobility, thus limiting the ability to make nation-wide conclusions. Therefore, surveying the students from across the country would provide a more reasonable picture of students' mobility and allow researchers to support the proposed management recommendations. Second, the present study does not address the issue of academic staff mobility, which is equally significant in ensuring the resilience of Ukrainian universities. The presence of trained specialists from Ukraine in international institutions and the structuring of an influential foreign diaspora could put Ukraine on the agenda of global policy. But are Ukrainian universities ready for such social responsibility? Are they aware of such a mission? The authors believe that this question can become an additional direction of research.

Concurrently, conducting an in-depth analysis of additional components within the structure of student outflow can lead to a more comprehensive understanding of the student's motivations and the challenges that emerge throughout their academic pursuits. Universities could implement this data-driven approach by establishing dedicated institutional research departments.

Data collection information

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